

SECTION 35 20 23.13

SCOW SILENT INSPECTOR

PART 1 GENERAL

1.1 DESCRIPTION

The work under this contract requires use of the Silent Inspector System to monitor the trip number, the time-position history for the scow, course over ground, speed and the hull status. Instrumentation will also be required to provide the heading and draft information, and ullage readings to calculate Total Dry Solids (TDS) of the sediment load. This performance-based specifications section identifies the minimum required output and precision and instrumentation requirements. The requirements may be satisfied using equipment and technical procedures selected by the Contractor.

1.2 SUBMITTALS

Government approval is required for submittals with a “G” designation; submittals not having a “G” designation are for information only. When used, a designation following the “G” designation identifies the office responsible for review of the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00, “SUBMITTAL PROCEDURES”:

SD-01 Preconstruction Submittals

Dredge Plant Instrumentation Plan; G, SAM-OP-J

SD-07 Certificates

Letter of Silent Inspector Certification; G, OP

1.3 PAYMENT

No separate payment will be made for installation, operation and maintenance for the SI system as specified herein for the duration of the dredging operations; all costs in connection therewith will be considered a subsidiary obligation of the Contractor and covered under the contract unit prices for dredging in the bidding schedule.

1.4 SILENT INSPECTOR CERTIFICATION

The Contractor is required to have a current Silent Inspector Certification for the scow instrumentation system to be used under this contract not later than ten

working days after issuance of the Notice to Proceed. Certification shall be based on an on-site scow inspection conducted by Silent Inspector Support Center personnel.

An Inspection Shall Include:

- A series of data quality checks as described in paragraph 3.4 “Compliance Inspection and Quality Assurance Checks”,
- Verification of data acquisition and transfer (Paragraph 3.2),
- Review of the Dredge Plant Instrumentation Plan (DPIP) as described in Paragraph 1.5.

A Silent Inspector Certification is valid for one year from the date of certification if the system is not turned off, disconnected or removed from the scow. The owner or operator of the scow should contact the SI Support Center at 1-877-840-8024 on an annual basis to schedule re-inspection, allowing ample time for recertification, and coordinate this with all local authorities. The Contractor shall have personnel, who are familiar with the SI system instrumentation and who have the ability to recalibrate the sensors, on site during the inspection. Re-inspection is required for any yard work which produces modification to displacement (i.e. change in scow lines, repositioning or repainting hull marks), any yard work which produces modification to bin volume (change in bin dimensions or addition or subtraction of structure) or changes in sensor type or location; these changes will be reported in the sensor log section of the DPIP.

1.5 DREDGE PLANT INSTRUMENTATION PLAN (DPIP)

The Contractor shall have a DPIP on file with the National SI Support Center. The Contractor shall also maintain a copy of the DPIP on a working dredge on site which is easily accessible to Government personnel at all times. This document shall describe how sensor data will be collected, how quality control on the data will be performed, and how sensors/data reporting equipment will be calibrated and repaired if they fail. A description of computed scow specific data and how the sensor data will be transmitted to the Silent Inspector Database will also be included. The Contractor shall submit to the SI Support Center any addendum or modifications made to the plan, subsequent to its original submission, prior to Notice to Proceed.

The DPIP shall include the following as a minimum:
(DPIP must have table of content in the following order)

- Dredging Company
 - Dredge Point of Contact
 - Phone Number
- Scow Monitoring System Provider
 - Scow Monitoring System Point of Contact
 - Telephone Number

- Scow ID
- Sensor repair, replacement, installation, modification or calibration methods
- Data reporting equipment
- Procedure for providing sensor data/computed data to SI Database via e-mail
- System Power Supply
- System Battery Charge Method
- If the system is left in place past the end of the contract, how will the contract number be changed
- System telemetry
- Dimensioned Drawings of the Scow
 - A typical plan and profile view of the scow showing:
 - Bin cross sections
 - Locations of required sensors referenced to:
 - fore and aft perpendicular
 - bin length, depth, width, zero reference
 - external hull draft markings (latitudinal, longitudinal, keel)
 - each other
 - overall scow dimensions
- Criteria and method used to increment trip number
- Description of how the UTC time stamp is collected
- Positioning system
 - brand name and specifications
 - sampling rates for data acquisition (standard vs. dump)
 - scow heading instrumentation brand name and specifications
 - instrument used to calculate COG
 - any calculation done external to the instrumentation
 - certificates of calibration and/or manufacturer certificates of compliance
 - A description of how scow speed is determined
- Hull status
 - Instrumentation brand name and specifications
 - Certificates of calibration and/or manufacturer certificates of compliance
 - Any calculation done external to the instrumentation
 - Criteria for determining hull open/closed
- Drafts:
 - instrumentation brand name and specifications
 - certificates of calibration and/or manufacturer certificates of compliance
 - any calculation done external to the instrumentation
 - criteria used to determine draft

- Displacement:
 - Method used by Contractor to calculate displacement based on fore and aft draft
 - Tables listing (fresh and salt water) displacement as a function of draft certified by a licensed marine surveyor/ naval architect independent of the contractor (ft and tenths of ft)
 - These methods and tables must be an accurate reflection of the current configuration and displacement
- Bin Ullage:
 - Sensor brand name and specifications
 - Certificates of calibration and/or manufacturer certificates of compliance
 - Any calculation done external to the instrumentation
 - Criteria used to determine ullage
- Volume:
 - Method used by Contractor to calculate bin volume based on fore and aft bin ullage
 - Table which lists the bin volume as a function of bin ullage certified by a licensed marine surveyor/ naval architect independent of the Contractor (ft and tenths of feet). Upon approval, each page of the ullage table will receive the visible, dated Silent Inspector stamp. The Contractor shall include his copy of the SI stamped table in the on-board copy of the DPIIP.
 - These methods and tables must be an accurate reflection of the current configuration and volume
- Refractometer
 - Brand
 - Resolution and minimum accuracy
 - method of calibration
- Bin status criteria used to determine open/closed measurements of bin status
- Contractor Data
 - Backup frequency
 - Backup method
 - post processing
- Archive capability
- Documentation of :
 - test methods used by the Contractor to provide quality control of data
 - verification that the reported values are applicable for the sensor and application
- Log of sensor performance and modifications

Any changes to the computation methods during the contract shall be approved by the Silent Inspector Support Center prior to their implementation.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 REQUIREMENTS FOR REPORTED DATA

The Contractor shall provide, operate and maintain all hardware and software to meet the specifications. The Contractor shall be responsible for replacement, repair and calibration of sensors and other necessary data acquisition equipment needed to supply the required data.

Repairs shall be completed within 48 hours after any sensor failure occurs. Upon completion of a repair, replacement, installation, modification or calibration the Contractor shall notify the Contracting Office's Representative. The Contracting Office's Representative may request re-calibration of sensors or other hardware components at any time during contract execution as deemed necessary.

The Contractor shall keep a log of sensor repair, replacement, installation, modification and calibration in the dredge's onboard copy of the DPIP. The log shall contain a three year history of sensor maintenance to include: the time of sensor failure (and its subsequent repair), the time and results of sensor calibrations, the time of sensor replacements, and the time when backup sensor systems are initiated to provide required data. It shall also contain the name of the person responsible for the sensor work. Only sensors that affect the data reported in paragraph 3.2.6, "Reporting Data Metadata", are affected by this logging requirement.

3.1.1 Scow Name

Each scow shall be assigned a unique name that will remain constant from one dredge operation to the next.

3.1.2 Trip Number

A trip number shall be reported for each dump run. The trip number will be incremented at the completion of each dump/emptying of the scow. Each scow shall maintain a separate trip numbering sequence – i.e. each scow will start with a trip number of 1, that will be incremented by 1 each time that scow completes a dump.

3.1.3 Horizontal Positioning

Horizontal positioning of the antenna location or center of scow shall be obtained using a Positioning System operating with a minimum accuracy level of 1 to 3 meters horizontal Circular Error Probable (CEP). Positions shall be reported as Latitude/Longitude WGS 84.

3.1.4 Date and Time

The date and time shall be reported to the nearest second and referenced to UTC time based on a 24 hour format.

3.1.5 Hull Status

Open/closed status of the bin, corresponding to the split/non-split condition of a split hull scow shall be monitored. An “OPEN” value shall indicate the hull is split. A “CLOSED” value shall indicate the hull is not split. For non-dump scows, the “OPEN” value shall indicate that the bin is in the process of being unloaded, either by pumping or mechanical means.

3.1.6 Scow Course

Scow course-over-ground shall be provided using industry standard equipment. The Contractor shall provide scow course over ground (to the nearest whole degree) with values from 000 (true north) to 359 degrees referenced to a clockwise positive direction convention.

3.1.7 Scow Speed

Scow speed-over-ground shall be provided in knots using industry standard equipment with a minimum accuracy of 1.0 knots and resolution to the nearest 0.1 knot.

3.1.8 Scow Heading

Scow heading shall be provided using industry standard equipment. The scow heading shall be accurate to within 5 degrees and reported to the nearest whole degree, with values from 000 (true north) to 359 degrees referenced to a clockwise positive direction convention.

3.1.9 Scow Draft

Draft measurements shall be in feet with an accuracy of 0.1 foot, and reported with a resolution to the nearest 0.01 foot relative to the fore and aft draft marks. Each sensor shall be placed at an optimum location on the scow. Industry standard pressure sensors, or an equivalent system, may be used. Two draft

sensors, one fore and one aft, will be required. At the discretion of the SI Support Center, a system may use other means of measuring drafts if accuracies and resolution are maintained relative to the draft marks.

3.1.10 Scow Displacement

Scow displacement shall be reported in long tons, based on the most accurate method available for the scow. The minimum standard of accuracy for displacement is interpolation from the displacement table, based on the average fore and aft draft readings.

3.1.11 Scow Bin Ullage

Fore and aft bin ullage shall be measured with an accuracy of 0.1 foot and reported with a resolution of 0.01 feet relative to the bin zero reference elevation. A minimum of two sensors is required, one fore and one aft. If only two sensors are used, they shall be mounted in locations as near as possible to the bin centerline. If one sensor is offset to port or starboard, the other sensor shall be offset on the opposite side of the bin. If more than one fore or one aft sensor is used, they shall be placed near the corners of the hopper and a forward average value and aft average value shall be reported. At the discretion of the SI Support Center, a system may use other means of measuring ullage if the required accuracy and resolution are maintained.

3.1.12 Scow Bin Volume

Scow bin volume shall be reported in cubic yards, based on the most accurate method available for the scow. The minimum standard of accuracy for bin volume is interpolation from the bin ullage table, based on the average fore and aft ullage readings.

3.1.13 Scow Lightship

Scow Lightship value shall be reported in long tons and shall be the value of the (empty) displacement of the scow; the weight of the scow with no material in the bin.

3.1.14 Tons Dry Solids (TDS)

TDS shall be reported in long tons using the following equation:

$$\text{TDS} = \left(\frac{\text{mass of dredged material}}{\text{volume of dredged material}} - \text{density of water} \right) / (\text{density of solids} - \text{density of water}) * \text{density of solids} * \text{volume of dredged material}$$

Where:

mass of dredged material in kg = (loaded scow displacement in LT -lightship
 displacement in LT) * 1016 kg/LT
 volume of dredged material in m³ = (loaded bin volume in yd³ - residual bin volume in
 yd³) * 0.7646m³/yd³
 density of water in kg/m³ = specific gravity of water in g/cm³ * 1000
 and density of solids in kg/m³ = specific gravity of dredged material in g/cm³ * 1000

For this job, TDS shall be calculated using a density of solids of _____ kg/m³, based on the material being dredged.

sand and gravel will range between 2,650 & 2,670 kg/m³; cohesive silts and clays vary between 2,680 and 2,750 kg/m³)

3.2 DATA REPORTING REQUIREMENTS

Contractor collected information shall be transmitted to the SI Database. The parameters which shall be reported to the SI Database include: trip number, date and time, hull status, scow course, scow speed, scow heading, draft, bin ullage and volume, displacement, and TDS.

3.2.1 Data Reporting Interface

The Contractor may select any commercial satellite, cellular phone, or other data communications systems available to transmit the data to the SI Database via the Internet in the required mail message format. The data transition process from the scow to the SI database must be automated. The data may be sent from the scow directly to the SI database or to a shore based computer. Data transmitted to the SI Database should be raw data; any processing of the data conducted shore side shall be done using an automated software or programming routine. A description of this process shall be included in the DPIP.

3.2.2 Data Measurement Frequency

Data shall be logged as a series of events. Each set of measurements (e.g. time, position, etc...) will be considered an event. Data shall be measured with sufficient frequency by the scow system to resolve the events to the accuracy specified in the following table.

Event Type	Scow Status	Event Description	Event Time Resolution	Event Position Resolution
1	Stationary/loading with hull status "CLOSED"	An elapsed time of 1 hour since the last event	1 minute	NA

2	Moving with hull status "CLOSED"	Distance from the last event position equals or exceeds 0.5 nautical miles	1 second	+/- 10 ft
3	Hull status "OPEN"	A position must be recorded within 1 second of the hull status going from CLOSED to OPEN – distance from the last event position equals or exceeds 30 feet	1 second	+/- 10 ft

The system shall have the capability of storing at least the previous 1000 events. A time trigger may be used for event types 2 and 3 at the discretion of the SI Support Center, if it can be demonstrated that the data density will be consistent with the above logic.

3.2.3 Data Reporting

The system shall report the event history via Simple Mail Transport Protocol (SMTP) e-mail message to the SI Database Server. For this contract data will be reported _____. *on an event basis (sent as data is collected) – OR - on a load basis (all the events for a load cycle are sent at the same time, immediately upon the completion of the cycle) - OR - at regular intervals such that the time between data collection and its reporting does not exceed 6 – OR- 12 – OR - 24 hours.* All data for an event shall be transmitted to the SI Database no later than 24 hours after the event's occurrence.

If the scow has a certified system aboard, it shall transmit data continuously to the SI Database from mobilization until the final USACE post-dredging survey has been accepted. If the scow does not have a certified system at the time of issuance of the Notice to Proceed, it shall begin transmitting data at the time it is certified prior to the start of dredging operations, and continue until acceptance of the final USACE dredging survey.

In the event of sensor failure, a manual dump log shall be maintained and submitted on a daily basis to the Contracting Officer's Representative.

3.2.4 Mail Message Format

The Simple Mail Transport Protocol, SMTP, (Internet FRC 2821) shall be used to report data to the SI Database. Mail messages shall have the following contents (Internet RFC 2822):

To: sidatatransfer@usace.army.mil
From: contractor's email address

Subject: SISDATA Transfer
Attachment: SI SDATA html file

Mail message start of body
SISDATA
SI Scow Data Transfer
Blank line

Optional additional annotations from the Contractor – all data after the blank line are ignored.

End of message

3.2.5 Mail Attachment File Format

The attached data file shall be a MIME encoded (Internet RFC 2045) Extensible HyperText Markup Language (W3C standard XHTML 1.1) document. Any length of data may be included, but the file attachment size should not exceed six Megabytes. Only the html, table, tr, th, td, h2, h3 and body tags are permissible.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html
PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="eng">
<body>

<h2 class = "contract">contract number</h2>
<h3 class = "vessel_name">scow name</h3>

<table class = "SISDATA">
<tr>
<th>TRIP_NUMBER</th>
<th coord_type = "(LL)">X_POSITION</th>
<th coord_type = "(LL)">Y_POSITION</th>
<th>DATE_TIME</th>
<th>HULL_STATUS</th>
<th>SCOW_COURSE</th>
<th>SCOW_SPEED</th>
<th>SCOW_HEADING</th>
<th>SCOW_AVG_DRAFT</th>
<th>SCOW_FWD_DRAFT</th>
<th>SCOW_AFT_DRAFT</th>
<th>SCOW_DISPLACEMENT</th>
```

```

<th>ULLAGE_FWD</th>
<th>ULLAGE_AFT</th>
<th>SCOW_BIN_VOLUME</th>
<th>SCOW_LIGHTSHIP</th>
<th>SCOW_TDS</th>
</tr>

<tr>
<td>trip number value</td>
<td>x position value</td>
<td>y position value</td>
<td>date time value</td>
<td>hull status value</td>
<td>scow course value</td>
<td>scow speed value</td>
<td>scow heading value</td>
<td>average draft value</td>
<td>fwd draft value</td>
<td>aft draft value</td>
<td>displacement value</td>
<td>fwd ullage value </td>
<td>aft ullage value </td>
<td>bin volume value</td>
<td>scow lightship value</td>
<td>tds value</td>
</tr>
<tr>
... repeated for additional data records
</tr>
</table>
</html>
</body>

```

3.2.6 Reporting Data Metadata

Data shall be reported to the SI database using the tags and criteria specified in the following table:

Header Tag	Tag Notes
vessel_name	The name of the scow
contract	The USACE contract number under which the work is being performed, or the applicable permit number.
TRIP_NUMBER	Trip numbers shall start at 1 at the beginning of work for each contract or permit. Trip numbers are incremented at the completion

Header Tag	Tag Notes
	of the disposal/placement part of the scow cycle. Each scow maintains a unique set of trip numbers.
X_POSITION	Longitude in decimal degrees. West Longitude values are reported as negative.
Y_POSITION	Latitude in decimal degrees. North Latitude values are reported as positive.
DATE_TIME	mm/dd/yyyy hh:mm:ss defined as UTC time in 24hr format.
HULL_STATUS	OPEN or CLOSED are the only permissible values.
SCOW_COURSE	The scow course over ground reported from 0 to 359 degrees.
SCOW_SPEED	The scow speed measured in knots at the reported time.
SCOW_HEADING	The scow heading reported from 0 to 359 degrees.
SCOW_AVG_DRAFT	The representative draft of scow below waterline in feet. This is the draft of scow computed from an average reading of the fore and aft sensors at an optimum location.
SCOW_FWD_DRAFT SCOW_AFT_DRAFT	Draft of scow below waterline in feet relative to forward and aft draft mark locations.
SCOW_DISPLACEMENT	Weight of the scow at the time of measurement in long tons as described in DPIP.
SCOW_AVG_ULLAGE	The representative ullage of scow bin in feet. This is the bin ullage measure of scow computed from an average reading of the fore and aft sensors at an optimum location.
SCOW_ULLAGE_FWD SCOW_ULLAGE_AFT	Distance from the bin level zero down to the surface of the dredged material in the bin (measured in feet).
SCOW_BIN_VOLUME	Volume of the bin in cubic yards computed from the ullage sensor values.
SCOW_LIGHTSHIP	The value of the (empty) displacement of the scow in long tons.
SCOW_TDS	Tons Dry Solids calculated in Long Tons 3.1.13

3.2.7 Contractor Data Backup

The Contractor shall maintain an archive of all data sent via SMTP to the SI Database. The Contracting Officer's Representative may require (at no increase in the contract price) that the Contractor provide a copy of these data covering specified time periods. The data shall be provided on PC format USB flash drive, CD-ROM, file transfer protocol (ftp) upload, or other storage medium acceptable to the Contracting Officer's Representative. At the end of the dredging contract the Contractor is responsible for contacting the national SI Support Center prior to discarding the data to ensure all data have been appropriately archived. The person who made the call, the date of the call, and the representative who gave permission to discard the data should be recorded in a separate section at the end of the Contractor's copy of the DPIP.

3.2.8 Data Reporting Example

```

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="eng">
<body>
<h2 class = "contract">DACW01-03-C-0011</h2>
<h3 class = "vessel_name">COE Scow 3</h3>
<table class = "SISDATA">
<tr>
<th>TRIP_NUMBER</th>
<th coord_type = "LL">X_POSITION </th>
<th coord_type = "LL">Y_POSITION </th>
<th>DATE_TIME</th>
<th>HULL_STATUS</th>
<th>SCOW_COURSE</th>
<th>SCOW_SPEED</th>
<th>SCOW_HEADING</th>
<th>SCOW_AVG_DRAFT</th>
<th>SCOW_FWD_DRAFT</th>
<th>SCOW_AFT_DRAFT</th>
<th>SCOW_DISPLACEMENT</th>
<th>SCOW_AVE_ULLAGE</th>
<th>SCOW_ULLAGE_FWD</th>
<th>SCOW_ULLAGE_AFT</th>
<th>SCOW_BIN_VOLUME</th>
<th>SCOW_LIGHTSHIP</th>
<th>SCOW_TDS</th>
</tr>
<tr>
<td>2</td>
<td>-82.479309 </td>
<td>28.073948 </td>
<td>04/11/2002 13:11:55</td>
<td>OPEN</td>
<td>3.2</td>
<td>312</td>
<td>313</td>
<td>5.72</td>
<td>5.53</td>
<td>5.91</td>
<td>2560.4</td>
<td>2.52</td>
<td>2.31</td>
<td>2.72</td>
<td>5006.8</td>

```

1052.2
4376.3
3
-82.479319
28.073968
04/11/2002 13:12:05
CLOSED
3.2
311
312
5.45
5.0
5.91
2563.4
2.52
2.31
2.72
4936.8
1052.2
4398.7

3.3 PERFORMANCE REQUIREMENTS

The Contractor’s Silent Inspector system shall be fully operational at the start of dredging operations. To meet contract requirements for operability, the Contractor’s system shall provide a minimum 95 percent data return and be 95 percent compliant with DPIP requirements. Data return percentage is defined as the total number of quality records sent, divided by the total possible number of records that could be sent by a system in good working order. Quality data strings are considered to be those providing accurate values for at least 16 of the 17 data parameters reported. DPIP compliance is determined by percent of items listed in Paragraph 1.5 to be at minimum compliance. After fifty percent project completion, combined percentage of data return and DPIP compliance should equal 95 percent or greater. If repairs necessary to restore 95 percent data return are not made within 48 hours, or if the Contractor fails to report required data within the specified time window for scow measurements (see paragraph 3.2.2 “Data Measurement Frequency” and 3.2.3 “Data Reporting”); the system will be declared not fully operational, and the Contractor will be assessed liquidated damages equivalent to the additional oversight hours that would be required for Corps personnel to be on site from the first full day after the system is deemed not

fully operational through to the time when the system is returned to operational status. For this contract, the liquidated damages shall be \$ _____ per day.

3.4 COMPLIANCE INSPECTION AND QUALITY ASSURANCE CHECKS

The Contractor shall submit a test data package to the SI Database from the system on each scow and have it accepted by the SI Support Center prior to scow compliance inspection.

Quality assurance checks are required prior to the commencement of dredging, and at the discretion of a Contracting Officer's Representative periodically throughout the duration of the contract. As part of the testing requirements, the Contractor shall provide the Contracting Officer's Representative a visual display of measurements from the scow monitoring system in the same units that are submitted to the SI database. These measurements shall be provided in real-time on the scow or near real-time on location. The Contractor shall also submit data collected during the inspection from the scow monitoring system to the SI database at completion of inspection.

3.4.1 Position Check

During certification inspections, both the static position of the scow and a track of movement to and from the dump area will be monitored by an independent GPS unit and compared to the SI collected data. A contractor furnished tug will be required to transport the scow during this check, which will monitor time position of the scow, and verify that data collection intervals change as the scow enters and leaves the disposal area. Throughout the contract, the Contracting Officer's Representative will periodically verify reported positions by independently measuring with other equipment to verify locations.

3.4.2 Hull Status Check

The Contracting Officer's Representative will document the angle at which the hull status sensor registers "OPEN" and "CLOSED".

3.4.3 Draft Sensor Check

Draft sensors will be checked by comparing the draft measurements reported by the monitoring system, with the draft measurements from the scows draft marks. Drafts will be checked light, loaded, and for other intervals at the inspector's discretion.

3.4.4 Bin Ullage Check

The Contracting Officer's Representative will periodically check the reported bin ullage against manually measured values using contractor provided tape, listed in Paragraph 3.5, measuring from multiple locations along the combing or from sensor location at his discretion.

3.4.5 Water Test

A water test will be required for one scow in each class operated by the Contractor. The water test shall consist of pumping the bin out to the Maximum Ullage Value Accurately Measured by Sensors (MUVAMS) and then filling the bin with water to capacity and comparing the system-measured water specific gravity to that of the value determined by analyzing water samples retrieved from the bin. If the results of the water test indicate that the computed displacement is not within five percent of the bin volume, the Contractor shall be required to correct the deficiencies causing the error and repeat the water test until the results are acceptable. Other water tests may be conducted during the contract for any scow at the discretion of the Contracting Officer's Representative.

3.5 LIST OF ITEMS TO BE PROVIDED BY THE CONTRACTOR

DPIP	Sec 1.5 Dredge Plant Instrumentation Plan
SI SYSTEM	
Sensor Instrumentation	Sec. 3.1 Specifications for Reported Data
SCOW DATA	
Event documentation	Sec. 3.2.2 Data Measurement Frequency
Data reports	Sec. 3.2.3 Data Reporting
QA EQUIPMENT ON DREDGE	
Ullage tape	Sec. 3.4.4 Bin Ullage Check
Refractometer –measuring in grams/cubic centimeter with a resolution of 0.001 and a minimum accuracy of +/- 0.001 with calibration water	Sec. 3.4.5 Water Test
Water sampling device	Sec. 3.4.5 Water Test